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TEST EFFECTIVENESS TREND OBSERVATION

Comparison of JPL Procured Flight Hardware with System Contractor Procured Flight Hardware

CONCLUSION:

There are significant differences in requirements implementation and problem tracking between JPL-directly-procured hardware and contractor-procured hardware which result in significantly fewer post-launch problems on JPL-managed hardware.

DISCUSSION:

A comparison of test and flight histories of JPL procured hardware with system contractor procured hardware was conducted to determine whether any differences exist in hardware reliability. The comparison was conducted by surveying the Problem/Failure Reports (PFR) and Incident Surprise Anomaly (ISA) reports for tape recorders, transponders, gyros, and telecommunication units developed independently for JPL procured units with system contractor procured units. The JPL procured hardware was directly JPL managed and employed the JPL PFR system; the system contractor procured hardware was managed by the system contractor and employed a slightly modified system contractor PFR system. There were slightly less than 2 times as many PFRs written on the JPL developed units than for the system contractor developed units during assembly and test prior to launch. However, during flight the contractor developed units experienced 2.5 times as many PFRs and ISAs as the JPL developed units.

The attached chart provides a comparison of the pre-launch and post-launch problem/failure history for both the selected flight hardware, and for all hardware on two flight programs. In terms of hardware procurement, JPL was responsible for the system on Galileo, while Magellan was performed in the system contractor mode. The chart also shows that the ratio of pre-launch PFRs for Galileo and Magellan was 3:1, but Magellan had a 2:1 ratio over Galileo of post-launch problems when all hardware is compared.

The attached Figure illustrates the comparison of the pre-launch and post-launch hardware problems for the selected hardware sets for the two programs.

The results obtained from the problem/failure reporting system, are an indicator of the attention of management to problems arising during flight hardware design and development. The JPL directly managed subsystem procurements and system appears to implement and interrogate the hardware design and development process in a more rigorous and thorough way, as exemplified by the pre-launch PFR reporting and closeout process. This, according to this data trend, results in fewer flight problems.

Jet Propulsion Laboratory

RELATIONSHIP OF FLIGHT HARDWARE PROBLEMS
(PROCUREMENTS THAT ARE JPL DIRECTLY MANAGED
VS W/O JPL DIRECT MANAGEMENT)

Procurements W/O JPL Direct Management	PRE LAUNCH	POST LAUNCH (Flight)	
	PFRS	ISA's	PFRS
MGN Tape Recorder	6	12	3
MGN Transponder	3	0	0
MGN Gyro	7	10	2
MGN Telecom	3	1	1
4 Item Total [*3]	19	23	6
All Hardware TOTALS [*4]	590[*1]	70[*2]	23
JPL MANAGED PROCUREMENTS	PFRS	ISA's	PFRS
GLL Tape Recorder	8	3	1
GLL Transponder	7	2	1
GLL Gyro	13	2	1
GLL Telecom	6	2	0
4 Item Total [*3]	34	9	3
All Hardware TOTALS [*5]	1929[*1]	36[*2]	16

[*1] Total of hardware PFR's as of 9/9/91 (excludes software & procedure PFR's)
[*2] Total of hardware ISA's as of 9/9/91 (excludes software & procedure PFR's)
[*3] A limited number of randomly selected flight hardware items were used for this study
[*4] Magellan was performed in the System Contractor Mode
[*5] Galileo was performed with JPL as the System Manager

Relationship of Flight Hardware Problems with and without JPL Direct Management